Complex hierarchical self-assembly templated by block copolymers

Christopher Li, Drexel University, DMR-0239415

Hierarchical self-assembly is an essential part of nanotechnology and it offers one of the few practical strategies for making ensembles of nanostructures. In this research, we employ liquid crystalline (LC) block copolymers to achieve complex hierarchical structures. One example is the rod-coil block copolymer poly(styrene-*block*-(2,5-bis-[4-methoxyphenyl]oxycarbonyl)styrene) (PS-b-PMPCS). The PMPCS segments act as the rod and the PS block act as the coil. For symmetric PS-b-PMPCS, bilayer smectic A phase have been observed. For asymmetric block copolymers, preliminary observation suggests complex structures such as smectic A_d phase as well as perforated layer structures might exist in this model system. Detailed structures are currently under investigation.

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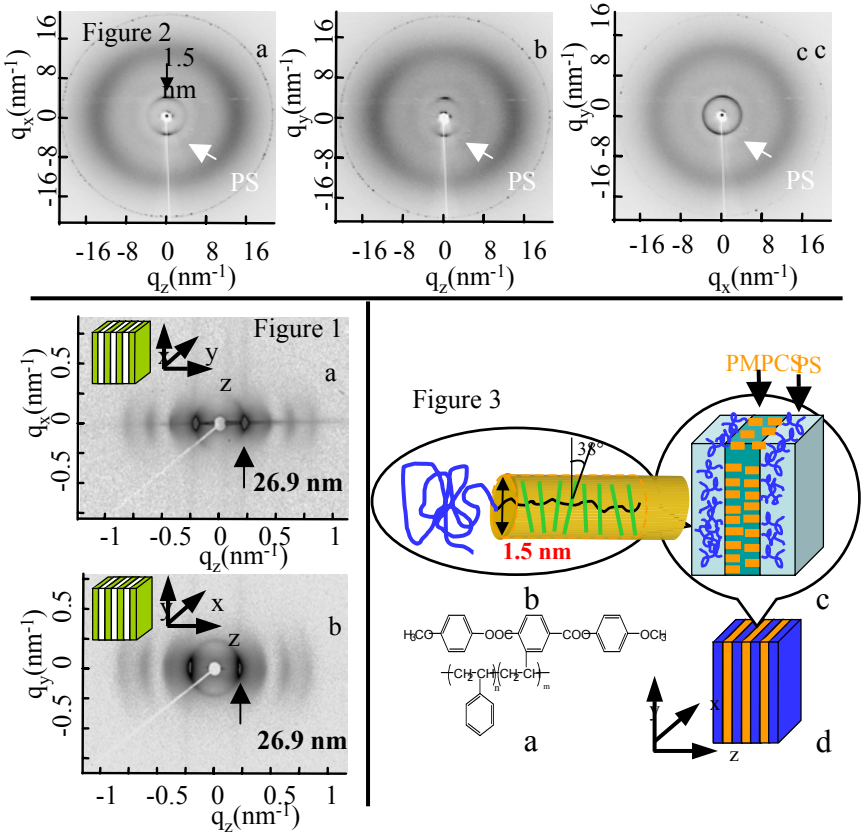

SAXS (Fig. 1) and WAXD (Fig. 2) of orientated rod-coil PS-b-PMPCS block copolymers. Fig. 3 shows the hierarchical structure of symmetric PS-b-PMPCS.

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Education

Under this grant, two graduate students are pursuing their Ph.D. degrees: Mr. Kishore Tenneti (2nd year) and Mr. Lingyu Li (3rd year); One student, Steve Kodjie (2nd year) is pursuing his Master degree. One undergraduate student (David Cochran) have also been supported.

The above picture shows that graduate students Kishore Tenneti and Steve Kodjie were teaching high school students to make slime and foams in the PI's polymer lab.

Outreach

- Host 150 - 200 / yr high school students / teachers per summer for the Drexel Summer Seed program. Students visit our laboratory and we conduct demon labs which have consistently been evaluated as the "best lab" in the entire COE.
- Host one freshmen student in summer to conduct nano science research.
- Host two high school students from IMSA in summer to conduct polymer research.
- Host one high school teacher for NSF-RET program.
- Launch and maintain a nano undergraduate education websites (www.materials.drexel.edu/prg/NUE.htm)

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